Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Expanding Flexible Use of 3.7 GHz to 4.2 GHz Band	)	GN Docket No. 18-122
	)	
	)	

REPLY COMMENTS OF PAUL LITCHFIELD

Paul Litchfield submits these reply comments in response to those submitted pursuant to the *Notice of Proposed Rule Making*, FCC 18-91, released July 13, 2018.

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I. INTRODUCTION

I am an investment professional[1] with decades of experience analysing financial, economic, and regulatory impacts on the companies which I hold a position in. Having followed these C-Band proceedings carefully for the past year and having read, with great interest, every filing, I have many thoughts on the comments submitted to the FCC. Given that no other investment professional has entered any comments into the record, I think it may be of interest to all parties to consider the many issues raised in the filings from a somewhat different perspective.

As I see it, there are four major issues at hand in this debate and they are all pulling in different directions. The issues are:

1. Amount of repurposed spectrum
2. Time to repurpose spectrum
3. Cost to repurpose spectrum
4. Protection of current users

While the method of repurposing is the primary focus of the debate, its main relevance is in terms of how it handles each on these four issues. Various other problems like the holdout problem, the monopoly supplier problem, etc. manifest themselves by affecting one of the four issues listed above. I will now analyse each of these issues in more detail and then conclude with a discussion of the various spectrum repurposing proposals on offer.

[1] As an investment professional I often hold positions in the companies I research and have held positions in Intelsat in the past. At the time of this writing I have no position in any of the companies discussed in this paper. Whether I enter into a position in the near term will depend upon the state of the overall equity market as well as the share price of the particular company. However, what is important to recognise is that the analysis always comes first and then the position follows. This order is never reversed.

II. AMOUNT OF REPURPOSED SPECTRUM

The amount of spectrum that will be repurposed should be thought of as the most important of the four issues. The reason is that C-Band users can be compensated, the benefits to society will far exceed any costs, a faster process might save a few months to a few years, but the amount spectrum repurposed will affect us for a decade or more.

Many commenters, including all three major wireless carriers, agree that the amount of spectrum cleared is critical. AT&T quotes Ericsson stating, "something on the order of 100MHz will be needed on a per-operator basis".[2] Verizon specifies, "the Commission should require an *Initial* Minimum Spectrum Benchmark greater than the C-Band Alliance's recent proposal of 200 MHz".[3] T-Mobile recommends "that a minimum of 300MHz be cleared."[4] Qualcomm voices, "The FCC should explore all options to fully clear the band of satellite incumbents before resorting to options that will lead to the repurposing of less than 500 MHz"[5] Nokia adds, "The public interest demands that the Commission require a plan and path forward for clearing additional spectrum in the band over and above the recently proposed 200 MHz"[6] And in an even stronger demand than quoted by AT&T above, Ericsson expresses, "we would like to see the vast majority if not all of the 3.7-4.2 GHz band repurposed for licensed mobile broadband use."[7]

[2] AT&T Comments at 6 (10/31/18). Note that FCC posting dates are being used for all citations.
[3] Verizon Comments at 9-10 italic emphasis added (10/31/18).
[4] T-Mobile Comments at 2 (10/31/18).
[5] Qualcomm Comments at 5 (10/31/18).
[6] Nokia Comments at 7 (10/31/18).
[7] Ericsson Comments at 10 (10/31/18).

A. Accepting the C-Band Alliance's Offer to Clear 200MHz Will Impose Numerous Adverse Effects on the 5G Industry

The underlying theme of all these comments is that the 200MHz being offered by the C-Band Alliance (CBA) is grossly inadequate. To accept such a proposal will create multiple negative outcomes that will be felt by the industry for a decade or more.

First, it will lock in *only* 200MHz for years to come. In a best case scenario, three years from now, when the 200MHz offered is finally being used for 5G, discussions can begin again about additional spectrum. But, the world will have changed a lot by then with new technologies, new methods, new business goals, and even new players being introduced into the equation. This will necessitate another lengthy rule making process to figure out how much additional spectrum to clear. And Intelsat/SES are on the record as stating that clearing further spectrum would be much more time consuming.[8] Thus, if we take the 3 years spent clearing the initial 200MHz, add to that an estimated 2 years for another rulemaking, and then 5 more years to clear the additional spectrum, a decade has passed before any additional spectrum is repurposed.

Second, because the methods employed to clear 200MHz won't look anything like what needs to be done to clear 300 – 500MHz, substantial time and money will be wasted. If 200MHz is initially cleared, then when it comes time to clear additional amounts, many of the steps taken to clear the initial 200MHz will have to be undone. Only if the final amount of spectrum to be cleared is known up front, can the clearing be done in the fastest and most cost efficient manner.

Third, the wireless industry needs certainty as to what the final amount of cleared spectrum will be so it can plan its investments and even intelligently make bids for spectrum

[8] SES/Intelsat Ex Parte at 2 (5/9/18). In this particular document they were referring to clearing additional spectrum beyond the 100MHz then offered. This of course, gives an even stronger indication of how much more difficult and time consuming it will be to clear spectrum beyond 200MHz.

being auctioned in the near term. Without such certainty, the sector will suffer from underinvestment compared to what could have been the case.

B. The CBA Spectrum Clearing Proposal Has Backpedalled from Prior Discussions

On the surface the latest CBA proposal appears to have made progress in moving towards an agreeable solution for all parties in the spectrum reallocation debate. However, a look under the hood of their proposal shows this is not actually the case.

First, whilst the latest offer provides 180MHz of usable spectrum (vs 100MHz previously), 30MHz of that came from reducing the guard band. As Nokia (p.6) points out, this is just an "incremental 25% increase in cleared spectrum"[9] from what was offered 6 months ago, back in April. And the 180MHz the CBA is proposing to make available is still well short of any of the carrier's or equipment maker's minimum acceptable amount.

Second, in an added twist, the CBA is not even guaranteeing that we get that 180MHz. The CBA proposal states, "Whether the full 200 MHz is ultimately repurposed will depend on demand from terrestrial mobile broadband providers."[10] Later they make the claim, "Satellite operators, not the government, are best positioned to determine how much spectrum to make available".[11] But what about the 5G users of the spectrum? And what about the equipment makers who create the technical standards for 5G? Why aren't they considered? Surely these two groups would know more than anyone about how much spectrum should be made available. But no; the CBA will be the sole decision makers about how much spectrum is repurposed, and it may even be less than the offered 180MHz.

[9] Nokia Comments at 6 (10/31/18).
[10] C-Band Alliance Comments at 5 (10/30/18).
[11] Id at 24-25.

Third, and what is most concerning of all, is that in the 152 page proposal released by the CBA, there is nothing, not even a single word, about clearing spectrum beyond 200MHz. This is a giant step backwards. Previously they were open to additional spectrum being cleared, noting, "The Parties stated that if the terrestrial demand for mid-band spectrum is as robust as claimed, their market-based approach could result in additional spectrum being cleared in the future".[12] But all these ideas have been quietly shelved in the CBA's latest submission. Intelsat CEO Stephen Spengler so much as confirmed this 3 times during the October 30 post earnings conference call, saying, "We have not done work beyond that [200MHz] to determine how do we go higher, when do we go higher", "we haven't looked at it [going higher] in any specific detail", and "it's not a topic of conversation within the consortium right now".[13] Thus, one must conclude that the CBA not only lacks plans to clear spectrum beyond 200MHz, but that they never intend to clear any additional spectrum.

One maxim of negotiations is that the positions of all parties should move towards each other to try to find a middle ground upon which agreement can be reached. However, in the eight and a half months[14] that has intervened since the satellite consortium's first proposal, they have actually gone backwards. Given this lack of good faith, they have effectively chosen to opt out of the negotiation process. Therefore more time should not be granted for them to make amendments to their proposal, and a regulatory solution should be pursued instead.

C. What is optimal amount of spectrum to be repurposed?

The answer to this question can be arrived at in several different ways. One way is to look at the situation from a competitive stand point and consider how much similar spectrum is being cleared by other major countries. Given that China will clear 500MHz of mid-band

[12] Intelsat/SES/Intel Ex parte at 1 (4/24/18).
[13] https://seekingalpha.com/article/4215885-intelsat-sa-q3-2018-results-earnings-call-transcript
[14] http://www.intelsat.com/news/press-release/intelsat-and-ses-propose-joint-use-of-c-band/

spectrum in 2018/19, Japan aims to release 500MHz of spectrum by early 2019, and Germany also has plans to clear 400MHz early in 2019[15], it seems completely unacceptable for the US to adopt 180MHz of spectrum as a final number.

1. Valuing the Spectrum

A second way to answer this question is to look at the situation from an economic standpoint. It is clear that using an economic approach all 500MHz should be cleared. In fact, the Brattle Group Report[16], commissioned by Intelsat/SES/Intel proves this beyond a shadow of a doubt. The report begins by telling us that from an economic efficiency standpoint the band should be put to the highest value use, stating "any given band at any specific time should be deployed for terrestrial uses if it creates more value (inclusive of transition costs)."[17] Next the report attempts to determine the value of the spectrum for mobile wireless use. A possible high and low value is calculated by using spectrum prices from a range of recent international spectrum auctions.[18] The low end of that range uses a spectrum value of $0.003/MHz pop which was the price of spectrum auctioned in Latvia. Now to compare spectrum values in the US to those in Latvia is so absurd it is not worthy of further comment. And to use a value of $0.003/MHz pop for US C-Band spectrum is so far off the mark that one should seriously question the credibility of this entire report.

For the high end of the range the report uses the price received for spectrum in Italy which was $0.415/MHz pop.[19] The report goes on to state several reasons why the "Italian auction may overstate the value expected for this band"[20] but neglects to tell the reader why

[15] David Abecassis et al., Mid-band spectrum geographical licensing approaches, Analysys Mason at 2-3 (July 2018)
[16] Intelsat/SES/Intel Comments at 16-64 (10/30/18).
[17] Id at 8.
[18] Id at 12.
[19] Id.
[20] Id.

this value may understate the value of US spectrum. The most glaringly obvious reason that any economist would be aware of is that the US has a 56% higher GDP per capital than Italy.[21] Using this fact alone could give you an estimated spectrum value of $0.65/MHz pop.

Most of the Wall Street analysts, that I have seen, estimate the value of the spectrum to be between $0.30 and $0.50/MHz pop. However some analysts have come out saying the spectrum is conservatively worth $0.50 -$0.60/MHz pop[22], and at least one has said more than $1/MHz pop is possible.[23] The bottom line is that the $0.415/MHz pop that the Brattle Report uses as an upper band, is not an upper band at all, but rather should be used as a base case estimate. Applying a corrected population number of 329 million[24] and using a $0.40/MHz base case price, the entire 500MHz of C-Band spectrum is very likely worth just under $66 billion. If the spectrum were to fetch $0.60/MHz pop it would be worth nearly $100 billion dollars.[25]

2. Cost of Clearing the Spectrum

The report then estimates the costs of relocating the C-band spectrum. First is the lost profits to satellite companies which is estimated to be $7.29 billion.[26] The report states that this is a high estimate because 1) is uses a revenue number instead of a profit number, 2) it uses retail rates instead of wholesale rates, 3) it assumes 100% transponder utilisation when it is actually between 70-80%, and 4) variable costs would be saved if transponder use was

[21] Central Intelligence Agency World Factbook, CIA.gov, accessed December 1, 2018 https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html. 2017 Estimates US GDP/capita $59,500. Italy GDP/Capita $38,100.
[22] Gagan Agrawal, "C-Band Spectrum Reallocation: Too Lucrative to Ignore?" Nsr.com, accessed December 2, 2018 https://www.nsr.com/c-band-spectrum-reallocation-too-lucrative-to-ignore/
[23] " Intelsat share price could go stratospheric", Advanced-television.com, accessed December 2, 2018 https://advanced-television.com/2018/09/27/intelsat-share-price-could-go-stratospheric/
[24] The Brattle Report at 14 uses an 8 year old US population estimate of 312 million. More recent estimates are available at https://www.census.gov/popclock/.
[25] $98.7 billion to be exact.
[26] Intelsat/SES/Intel Comments at 41 (page 20 of the Brattle Report) (10/30/18).

discontinued.[27] The report uses the service life remaining of the satellites to calculate this number, whereas I think it would be more appropriate to use the remaining length of each FCC FSS license to calculate this number. In that case it would be less than half the length used. But forgetting this issue and also not including any variable cost savings (point 4 above), if one uses a commercial price of 75% of the retail price to get a proper revenue number, applies an operating profit margin of 45%[28] to convert revenue to profit, then uses the known 75% transponder utilisation rate to reflect actual revenue received, a much more accurate estimate of $1.85 billion[29] in lost profits is produced. This is only one quarter of the number used by the Brattle Report.

After that the report looks at the transition costs for the earth stations to move to new methods of receiving their data. The report makes no attempt to even estimate these costs but says with no justification whatsoever that they "could easily be of the same or greater order of magnitude as the economic value of the retired satellite assets."[30] Given no estimates and no reasons, one can only assume they could easily be of a much lesser magnitude as well.

Finally, the report estimates the value of decommissioned satellite earth stations by multiplying the number of earth stations by the value of each earth station and arriving at $12.4 billion.[31] However, the report tells us that despite knowing that "the majority of these earth stations have already been deployed for a number of years and have depreciated in value"[32], no depreciation is assumed. Furthermore, the report informs us that despite knowing that "high-end C-Band earth stations range in price from $30,000 to $750,000"[33] the price assumed for all

[27] Id.
[28] Intelsat's was 42.6% for 2017. See Intelsat S.A. 20-F form for the year ended December 31, 2017, p. 31, accessed September 11, 2018, http://phx.corporateir.net/External.File?item=UGFyZW50SUQ9NDA0NTc2fENoaWxkSUQ9LTF8VHlwZT0z&t=1&cb=636610592570432516 ("Intelsat S.A. 20-F for the year ended December 31, 2017").
[29] $7.29b*75%*45%*75% = $1.85b
[30] Id at 42 (page 21 of the Brattle Report)
[31] Id at 43.
[32] Id.
[33] Id.

16,500 earth stations is $750,000. This is an incredible overestimate. Most earth stations are likely not even "high end earth stations", never mind being worth the undepreciated value of the single most expensive earth station in the whole United States. If we use a much more reasonable $100,000 cost and apply a 50% depreciation rate to it, we arrive at an estimate of only $850 million. This is less than 7% of the number used in the Brattle Report and even this number itself is probably a massive overstatement of the likely costs. It is not clear at all why most earth stations would need to be abandoned. Most of the equipment would still be useful if they moved to Ku band. Even if they went completely to fiber surely some of the equipment would still have value.

Now we can calculate a more accurate estimate of the costs of reallocating C-band. Even though I have huge doubts that the inestimable costs of transition are as much as the present value of all satellite profits I will use the Brattle Group logic here. This gives us a combined cost of only $4.55 billion.[34]

3. Potential Economic Gain from Clearing Spectrum

We can now compare this combined cost of relocation ($4.55 billion) to the above calculated base case value of the spectrum ($66 billion) and arrive at an economic gain of roughly $61.5 billion dollars. In optimistic scenarios (@$0.60/MHz pop) this figure could go as high as $94 billion dollars. In fact, this analysis is so lopsided in favor of reallocating spectrum that all the Wall Street analysts could be off in their spectrum value estimates by a factor of 10 (so $0.04/MHz pop) and there would still be $2 billion dollars of economic gain to be had.

Another way to give an intuitive check on the cost of relocation number is to look at the market value of all the satellite companies in the consortium, because it should reflect the

[34] $1.85b + $1.85b + $0.85b = $4.55b

present value of all their future profits. The day before the original consortium proposal was released (February 9, 2018)[35], all four satellite companies in the CBA had a combined market value of $15.19 billion.[36] Now this is the value of all of their profits for all of the different services they offer, and all the spectrums they utilise in 149 different countries. This shows how extraordinarily inaccurate the Brattle group estimate of $19.7b is, valuing the cost of clearing C-band at 30% more than the combined market value of the CBA members which includes the profits from every service offered, using every allocated spectrum, in nearly every country in the world.

In contrast, the cost of clearing estimate above ($4.55b) is almost exactly 30% of this market value number. If one considers only their profits from C-band, from only the United States, this looks to be quite a reasonable estimate. Thus, from an economic basis, no one should have even the slightest doubt that all 500MHz should be cleared for terrestrial wireless use.

4. Determining an Optimal Amount of Spectrum

Finally, if one really wants to know what the optimal amount of spectrum to be reallocated is, without any complicated analysis or even a single assumption, then one should just open up the whole 500MHz for auction and let the market decide. If it is optimal for any of the C-band to be used by satellites then satellite companies will bid in the auction and win some portion of the band. The satellite consortium is quite keen on this idea when applied to P2MP entrants. They suggest that if P2MP wants to use the C-band then they can bid for

[35] It is important to use this date because after the first proposal was released the share prices began to build in the prospects of receiving windfall gains.

[36] My calculation. On February 9, 2018, Intelsat price $US2.58, market cap $US0.35b; SES price €12.88, market cap $US7.13b; Eutelsat price €17.11, market cap $US4.87b. Telesat is not a publically traded company but using its revenues and multiplying by the average market cap/revenue ration for SES and Eutelsat generates an estimated market cap of $US2.83b

spectrum like everyone else, stating "the Market-Based Approach does not block potential buyers from deploying P2MP if that is the highest and best use of the C-Band Downlink."[37]

But why don't they apply that same logic to themselves? After all, the only difference between them and the P2MP operators is that they happen to be the incumbents. However, being an incumbent certainly is not a formula for determining optimality. If we really want to know what is optimal, we need to let the market decide.

The satellite consortium should be in favor of such an idea because they spend considerable time in their papers discussing optimality and efficiency. The CBA paper[38] uses the word efficient, or one of its derivatives, no less than 25 times, while the Intelsat/SES/Intel paper[39] mentions optimal 20 times and efficient[40] an astounding 61 times. They even go so far as to claim, "The market-based approach will enable optimal use of the mid-band spectrum in the most economically efficient manner"[41] It is not clear in what sense they use the word optimal, but if they mean economically optimal this claim is completely false because their approach can never achieve that. If you want to realize economic optimality you need to use a real market based approach, not a pretend one. The only thing market based about their "market based approach" is its name. To accomplish a true economically optimal allocation the FCC should throw open the entire band for auction and then everyone will find out exactly what the most efficient use of this spectrum is.

Given that the CBA proposal doesn't obligate them to any amount of spectrum clearing it is actually quite surprising they didn't adopt such a methodology. They could have easily said that they are open to clearing the entire 500MHz if the price is right. Then they could run their private negotiation process and get a feel for the prices that will be paid and then decide

[37] Intelsat/SES/Intel Comments at 8 (10/30/18).
[38] C-Band Alliance Comments (10/30/18).
[39] Intelsat/SES/Intel Comments (10/30/18).
[40] Or one of its derivatives.
[41] Id at 4.

how much spectrum to clear. At least that sort of process would begin to resemble something optimal. But instead of this, they have already determined that the optimal amount of spectrum that should be reallocated is a maximum of 200MHz. This shows their true intentions of never wanting to clear more than 200MHz. How did they come to such a conclusion?

5. Why isn't the CBA Clearing an Optimal Amount?

CBA proposal informs us that their proposal "accomplishes all of the Commission's goals"[42], one of those goals being "fully protecting incumbent satellite services".[43] Once this is recognized, it becomes easy to understand how the CBA might have come to the conclusion that the optimal amount of spectrum to be cleared is a maximum of 200MHz. To be sure this is definitely not an economically optimal outcome. But it may be optimal in freeing up some spectrum while fully protecting incumbent satellite services. If the CBA fairly looked at the services they provide and determined that the smallest amount of spectrum they can squeeze all those services into is 300MHz, then their proposal could be optimal in this sense.

However, there is one major problem with the CBA's approach. The objective of "fully protecting incumbent satellite services" isn't one of the FCC's goals. The FCC tells us that they have "the joint goals of making spectrum available for new wireless uses while balancing desired speed to the market, efficiency of use, and effectively accommodating incumbent Fixed Satellite Service (FSS) and Fixed Service (FS) operations in the band."[44] The FCC never uses the word 'protecting', let alone 'fully protecting'. They do talk about 'effectively accommodating' the operations in the band, which I construe to mean, finding a method which will allow current C-band users to continue to operate their businesses in a fully functional manner. Others may offer slightly different definitions, but what is sure is that it can't mean

[42] C-Band Alliance Comments at 2 (10/30/18).
[43] Id.
[44] Expanding Flexible Use of the 3.7-4.2 GHz Band, Order and Notice of Proposed Rulemaking, GN Docket No. 18-122, FCC 18-91, ¶ 2 (rel. July 13, 2018) ("NPRM").

being protected from leaving the C-band as the CBA has in mind. If this was the case the FCC never would have, in the first paragraph of the NPRM, said they, "seek comment on transitioning *all* or part of the band to terrestrial wireless broadband services."[45] Therefore, it is now obvious that if the CBA is optimizing on anything, it is definitely not maximising the economic value of the spectrum, and it is not something that the FCC should care about because it is not even one of their goals.

One final question that should be considered is, if it is in the economic interest of the CBA to clear more than the 200MHz of spectrum offered, why aren't they doing so? At a recent Information Technology & Innovation Foundation (ITIF) event[46] some sharply divided opinions about how much spectrum will eventually be cleared were displayed. In fact, it was almost comical to watch the CBA's lead spokesperson, Preston Padden and Peter Pitsch, the creator of the process the CBA is proposing, contradicting each other on this matter. Padden, when asked how they know 200MHz is the right amount of spectrum to clear, says, "because the 300 [MHz] that we would be left with is the minimum amount we need to service our existing customers."[47] Pitsch then replies, "at the end of the day market forces . . . will produce the right result"[48] Earlier in the presentation Pitsch had stated, "a market based approach is going to make more spectrum available where and when it is efficient"[49], "I can't get Preston to agree to that today, but no one in this record claims that the satellite operators are economically irrational"[50]. Well they sure seem like they are acting irrationally.

Further evidence of this irrationality appeared in their latest filing there the CBA states, "If the Commission adopts T-Mobile's proposal, the raison d'être for the C-Band Alliance

[45] NPRM ¶ 1.
[46] "Mid-band Spectrum: Transitioning the C-Band and More" held on November 13. https://www.youtube.com/watch?v=aA6x-f_bj_U
[47] Id at 1:12:52.
[48] Id at 1:15:07
[49] Id at 38:31.
[50] Id at 39:16.

would be lost and the C-Band Alliance would disband."[51] This is shocking, given that for spectrum amounts greater than 300MHz the T-Mobile proposal is essentially very similar to the CBA proposal and would undoubtedly reap them tens of billions of dollars. Yet without even knowing the size of the potential windfall, they have already written off the possibility of even considering it. This appears very irrational.

However, it is difficult to believe that any company with shareholders really acts irrationally. There must be another reason. My theory is that the reason for this seeming irrationality is that they have multiple long term contracts in place which would be difficult to break. This is nearly confirmed in their latest filing when they highlight, "The 200 MHz proposal is the result of months of hard work and analysis with respect to **contracted satellite usage requirements** and technical mitigation tools."[52] And again with, "Intelsat and SES Americom further assessed **contractual commitments**, customer growth requirements, advanced filter technologies and . . . to determine the maximum amount of spectrum that could be cleared in 18-36 months."[53] Thus 200MHz is the maximum amount of spectrum that they can clear without breaking these contracts. If they were to voluntarily agree to more than this number to achieve greater windfall profits, then they would be flush with cash and highly susceptible to breach of contract lawsuits. This would leave them facing years of litigation and uncertainty and place much of their windfall gains at risk.

In addition, as greater amounts of spectrum are cleared, the difficulty and costs increase exponentially. It is quite likely that by the time the final few MHz are cleared the marginal windfall profits are a small fraction of those for clearing the first 200MHz.

Therefore, a much more rational alternative would be to pick the low hanging fruit of 200MHz, and escape having to deal with the major difficulties, huge uncertainties, and high

[51] CBA Reply Comments at 34.
[52] Id at 3. Bold emphasis added.
[53] Id at 15. Bold emphasis added.

likelihood of years of litigation in clearing the remaining 300MHz. In contrast, if the FCC were to make a regulatory decision to repurpose the spectrum, then the satellite operators would be blameless. Also, given the fact that the FCC would fully compensate all C-band clients for any costs or losses, there would be little incentive to litigate. In addition, given that an FCC license is never guaranteed to last forever, I would be surprised if the satellite company's contracts didn't state that the contract is subject to the FCC continuing to grant the license.

Given that these formidable structural barriers are in place which prevent an optimal amount of spectrum from ever being cleared in the midterm, if more than 200MHz is desired, the only option for the FCC is to use regulatory power to acquire them.

III. TIME TO REPURPOSE SPECTRUM

There seems to be a general assumption that secondary market agreements (SMAs) will clear spectrum faster, and this is the major advantage of the C-Band Alliance (CBA) proposal. Nokia sums up these two thoughts best when they say, "the major benefit of a private sale proposal is the potential for a speedy transfer of spectrum when compared to the length of time, and regulatory steps likely required to execute a Commission-led public sale."[54]

But this assumption of the CBA having superior speed is called into question by several commenters. Google cites the historical failure of transition facilitators noting that "The Commission is painfully familiar with the 800 MHz rebanding effort."[55] There, Sprint began their planned 3 year role as a transition facilitator in 2005. But, "more than a dozen years later, the effort is still ongoing"[56]

US Cellular asks whether the three year time frame claimed by the CBA[57] is actually achievable, stating ""this claim largely is speculative given the untested, and likely extremely

[54] Nokia Comments at 2 (10/31/18).
[55] Google Comments at 12 (10/31/18).
[56] Id. at 13.
[57] C-Band Alliance Comments at i (10/30/18).

complex, nature of this approach and the large number of parties that would need to voluntarily make binding commitments and take specific actions within rather tight timeframes."[58] They contrast this with an FCC led process saying, "In contrast, the industry and the Commission have extensive experience with spectrum auctions, and thus, can reliably predict how quickly some or all of the 3.7-4.2 GHz band could be cleared through an auction process".[59] They also note that, unlike the CBA, the FCC would have power to enforce deadlines.[60]

A. Implementation

It seems to me that an important question to ask in this debates is, if the CBA proposal is really faster, why is it faster? How are they going to reduce the time compared to what the FCC could do? What do they think the FCC is doing wrong that makes them slower? What advantages do they have over the FCC? Certainly it is not experience or knowledge about auction processes. What is it then?

It can't be satellite related expertise because they are going to have to do all the protecting and moving, and repacking of existing users no matter what proposal is implemented. It shouldn't be something structural like asserting SMAs are simply faster than auctions. If that is the case, why doesn't the FCC just use SMAs? Should this be a new tool in the FCC's box of options to allow them to complete the job faster? Or, as I believe is the case, if the FCC has considered SMAs but determined them to be inferior to auctions for reasons of openness, transparency, fairness, and optimality of outcome, then why should anyone want the same inferior option to be conducted by a third party? It is difficult to envision many other good reasons for the claimed greater speed of the CBA proposal. Hopefully the reasons are not just cutting corners, overlooking necessary rules, or skipping contingency plans.

[58] United States Cellular Comments at 12 (10/31/18).
[59] Id.
[60] Id.

If good reasons do exist, the CBA never tells us. They simply make the claim, "The C-Band Alliance is committed to making as much as 200 MHz, including a 20 MHz guard band, of the C-band Downlink available for licensed terrestrial service within a period of only 18 months to 3 years—years before any proposed alternative mechanism could do so"[61] without a shred of evidence for why this is the case. But, if as most CBA proposal supporters state, speed is the most important element in favor of their proposal, there ought to be some extremely convincing substance behind this claim. Particularly given that the FCC tells us right on the main auction page of their website, "by using auctions, the Commission has reduced the average time from initial application to license grant to less than one year"[62]

Furthermore, as can be seen by the CBA's quote, this speed claim is only a commitment. There are no guarantees. And who is that commitment too? What happens if that commitment isn't met? More questions that the CBA provides no answers to.

The Intel/Intelsat/SES Joint NPRM Comments make the even stronger claim, "No other proposal could even come close to making C-Band spectrum available for terrestrial 5G use in such a short time frame."[63] They do a bit better than the CBA in at least attempting to justify such a statement, noting "Government-run auction approaches in this band would be inefficient, fraught with regulatory delay, and misalign market incentives."[64] But this statement raises more questions than answers. Is the FCC, with all of its expertise and experience in such matters really that inefficient?

As far as regulatory delays, exactly what are the regulations that the FCC would want to implement which this group doesn't feel the need for? Interested parties would like to be able to assess whether bypassing regulations is really good policy or just unjustified skimping which will come back to haunt us at a later date.

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[61] C-Band Alliance Comments at 10-11 (10/30/18).
[62] https://www.fcc.gov/auctions/about-auctions accessed December 7, 2018.
[63] Intel/Intelsat/SES Comments at 7 (10/30/18).
[64] Id at 9.

Perhaps the lack of regulatory delay should even be removed from the CBA's own list of speed advantages as it seems they have had a recent change of heart about the value of regulation. In the CBA proposal they say, "extensive FCC oversight of the Transition Facilitator is unnecessary and likely to delay deployment of 5G services in the C-band Downlink."[65] "Similarly, submission of a 'Transition Facilitation Plan' would divert resources to a needless administrative exercise and delay implementation."[66] "satellite operators are ready, willing, and able to work collaboratively with one another to implement the Market-Based Approach, with minimal guidance or oversight from the FCC required."[67]

However, more recently at an Information Technology & Innovation Foundation (ITIF) event on November 13, Preston Padden, Head of Advocacy & Government Relations for CBA, stated no less than 3 times during his presentation that the FCC will be making all the rules. "It is the FCC which will set the rules and make the key conditions in this process".[68] "The FCC gets to make the rules, period, full stop."[69] "I want to say again, the FCC is the one that gets to decide these issues and make the rules, full stop."[70] And even more recently the CBA states, "the Commission will have total authority to set the rules and to approve the flexible use licenses".[71] Thus, the obvious question arises, if the FCC sets all the rules, makes all the conditions, and decides all the issues, how is this plan any faster than a normal FCC run process?

The final clause in the Intel/Intelsat/SES comments about misaligning market incentives is difficult to understand. I assume they are referring to how the lack of windfall profits could lower their incentive to get the C-Band user movement and repacking job done quickly. However, there are ways to provide incentives in the other schemes, and even if there

[65] C-Band Alliance Comments at 22 (10/30/18).
[66] Id at 23
[67] Id.
[68] ITIF Presentation, https://www.youtube.com/watch?v=aA6x-f_bj_U at 17:38.
[69] Id at 1:08:48.
[70] Id at 1:20:39.
[71] CBA Ex parte at 11 (11/21/18).

weren't the CBA has already stated that they could get the job done in a maximum of three years. So the FCC should just hold them to this time frame and enforce it if necessary.

In the CBA Ex Parte just quoted, several more reasons attempting to justify the speediness claim appear. First is that "The FCC's auction calendar is quite full".[72] This statement implies a number of questionable assumptions, such as, the FCC's auction calendar can't get fuller, the FCC can't run simultaneous auctions, the FCC can't reorder auctions if this C-Band auction is the most important. And most importantly, that the FCC would rather have the CBA run auctions for them than employ a third party auctioneer themselves.

The Second reason is, "Our proposal does not require another rulemaking to set auction procedures".[73] This is not necessarily true given that the CBA was quoted above saying the FCC will make all the rules. Even if it is true, there may still need to be another rulemaking to determine other issues unrelated to auction procedures. Finally, another rulemaking could likely be completed in 3-4 months. Does anyone really consider 3-4 months a game changer in selecting a C-Band reallocation process?

Next on the same page of reasons why the CBA proposal is faster is the rather curious statement, "We have retained Auctionomics to help design our process".[74] Why this is reason the CBA process would be faster escapes me. The admission that the CBA is only at the stage of designing their auction process should seriously worry anyone who wants to get this project completed quickly. The FCC spent years designing, testing and refining its auction process. Now they arguably have the best auction technology in the world. Why would anyone want to take the risk of farming out the whole auction process to some untested third party who has never run a spectrum auction before?

[72] Id at 9.
[73] Id.
[74] Id.

B. Litigation

One of the CBA's primary justifications for why their proposal should be faster than competing proposals is idea that other proposals will get bogged down in litigation. The CBA, discussing alternative transition mechanisms, states, "These alternatives require far more heavy-handed government intervention and would likely be tied up in litigation for years to come."[75] This claim is stated more bluntly in the ITIF presentation handout which says, "Any effort to seize spectrum involuntarily would produce more than a decade of litigation."[76]

The obvious question that arises from this statement is whom do they think is going to be litigating against whom? Since all proposals have agreed that C-band users should be fully compensated, there would seem to be little reason for them to litigate in any of these other methods. Especially since the FCC would be the one compensating them in the alternative methods, it would seem ill advised to bite the hand that feeds you. So then who is going to be conducting all this litigation?

The only parties with any incentive to litigate are the satellite companies themselves who just lost their tens of billions of dollars windfall. So the conclusion can only be that it is the CBA doing the litigation against the FCC. This conclusion is strongly supported by the fact that in a presentation given to the FCC[77] which was largely identical to the one provided at the ITIF event, omits any mention of litigation. But, if litigation was a legitimate *external* concern, why would you not share that concern with the FCC?

So, if the CBA is going to launch legal action against the FCC, on what grounds would it be made? The CBA has admitted right in their proposal that the FCC is completely within its rights to reduce their spectrum allocation to zero.[78] So what is there to legally challenge? Thus,

[75] CBA Comments at iii (10/30/18).
[76] ITIF Presentation p.3 http://www2.itif.org/2018-preston-padden.pdf?_ga=2.8949623.318617344.1542278108-1891130228.1542278108
[77] CBA Ex parte (11/21/18).
[78] CBA Comments at 59 (10/30/18).

this litigation threat is very likely just a strategic bluff being made by the CBA. It is strongly in their interest to make the other proposals look bad so they can receive their windfall gains. If they can convince the gullible that a decade of litigation really is possible, then they stand much more likely to attain their prize.

Now, of course, someone can always launch a vexatious litigation claim. But in this case the statutory authority for the FCC to take such actions is so clear, there is little chance that litigation challenging this authority would slow down the clearing process implementation at all. And even if there were stronger legal issues involved, would the FCC ever want to favor a proposal whose primary justification was to remove the threat of legal action against them? I hope not.

In sharp contrast, it is highly likely that if the CBA plan is chosen the whole process really does get bogged down in years of litigation. There are several reasons for this.

First, there are literally thousands of potential litigants. Every single party with any relation at all to the C-band will be a possible litigant. All those deserving of compensation and, even those who don't, will have huge incentives to litigate against the CBA. They will know that CBA is under time pressure and is flush with tens of billions of dollars of newly received windfall gains, and so they will try to take advantage of that. No fair level of compensation that the CBA offers will ever be enough in their eyes while they possess such strong bargaining power. In addition, the CBA will be losing a dollar of profit for every dollar paid in compensation, and thus will have their own huge incentive to fight the litigation rather than give in and pay what they perceive is unreasonable compensation. The whole process is just a litigation time bomb waiting to go off.

Second, accepting the CBA proposal takes FCC into legal grey areas which will almost certainly be challenged. Section 309(j)(1) requires the Commission to use a competitive

bidding scheme to allocate licenses to mutually exclusive applications.[79] The CBA claims that this requirement doesn't apply to their proposal because there are no mutually exclusive applications.[80] Since a mutually exclusive application is simply one where the grant of one license would effectively preclude the grant of the same license to another applicant, it would seem that this would always be the case in terrestrial mobile wireless licenses. You can't have two different companies trying to operate in the same frequency bands. And there will always be multiple parties interested in highly demanded spectrum bands. So how can it be claimed that there are no mutually exclusive applications?

The CBA solution to this legal problem is to get the FCC to require parties wishing to apply for a license to already have obtained an SMA from the CBA.[81] Since the CBA will only ever create an SMA with one party, there can only ever be but one party who can apply for the license. Thus there can never be any mutually exclusive licences.

Wow, talk about smoke and mirrors. Effectively the CBA is asking the FCC to create a new rule (must have an SMA to apply) to get around their existing rule (the statutory mandate to auction mutually exclusive applications). If this can be done, why bother having any rules? I couldn't agree more with PISC who basically state that this is Alice in Wonderland logic.[82] Jokes aside, this raises so many legal questions it is not funny. Is the FCC even allowed to do this? If they are, what would Congress think of the FCC deliberately crafting rules to run around Congress's carefully defined mandates? And especially given that such a new rule would have the effect of depriving the US Treasury of tens of billions of dollars. Does injecting a third party in between the FCC and the multiple applicants really relieve FCC of its duty to conduct auctions? The only thing for sure about this matter is that it will be challenged. And this really

[79] 47 U.S.C. § 309(j)(1).
[80] CBA Comments at 29-30 (10/30/18).
[81] Id at 30.
[82] The Public Interest Spectrum Coalition (PISC) at 5 (10/31/18).

could delay the process for years, because no process can even start until it is determined if the FCC actually has the authority to conduct that process.

Third, multiple parties[83] have expressed their displeasure at the windfall gains likely being awarded under the CBA proposal. Because it is necessary for the FCC to actually grant the CBA terrestrial spectrum rights in order for those windfall gains to occur, the FCC appears to be complicit in this windfall gain giveaway. It thus seems highly likely that this decision itself will be the focus of legal action by at least one of these parties. This will bring the CBA process to a grinding halt.

Fourth is the possibility of a legal challenge under Antitrust Law because the CBA definitely resembles a monopoly seller. All it would take is for one of the wireless carriers to decide that they don't want to pay the above market prices that the CBA would necessarily be able to dictate, and so, launch their own litigation. Once again this would set the CBA process back years.

Fifth, existing FS providers claim that they are unjustifiably being treated differently to the satellite companies[84], especially given that, unlike the satellite companies, they actually do possess terrestrial licenses. The Small Satellite Organization claims that they should also be included in the CBA and potentially realise windfall gains for their unused US spectrum licenses.[85] Either of these two groups could add to the CBA's litigation woes.

In conclusion, there are just so many reasons the CBA proposal will end up in years of litigation there is a very good chance that their proposal turns out to be the slowest of those on offer. The Dynamic Spectrum Alliance probably summed up many of these reasons best when they said, " A process that shuts out potential participants, reduces government revenue to zero, and creates incentives to maximize profits for a subset of companies while minimizing payment

[83] E.g. Google, T-Mobile, Dynamic Spectrum Alliance, PISC and more.
[84] FWCC Comments (10/30/18).
[85] SSO Comments ((10/16/18).

to remaining FSS licensees, invites lengthy litigation."[86] So it seems the CBA actually has their facts backwards. It is the acceptance of the CBA proposal that will bog the spectrum repurpose down in litigation for a decade or more.

C. Political Risk

An issue closely related to the legal challenges described above are the political challenges. First, a number of firms have gone so far as to question the legality of using the CBA model and no less than three are demanding the FCC seek Congressional approval before adopting it. These firms have a valid point. 47 U.S.C. § 309(j) states the FCC's statutory obligations as follows:

> the Commission shall include safeguards to protect the public interest in the use of the spectrum and shall seek to promote the purposes specified in section 151 of this title and the following objectives:
>
> (C) **recovery for the public of a portion of the value of the public spectrum** resource made available for commercial use and **avoidance of unjust enrichment** through the methods employed to award uses of that resource;

It is difficult to see how the CBA proposal meets either of these two bolded requirements. As such, there really is a need to get approval from Congress for such a proposal or risk litigation. Yet, if this proposal goes to Congress for approval, few really think Congress would actually accept such a deal. With the current "America First" administration, the whole idea of letting a group of foreign satellite companies make important national decisions and reap billions of dollars of windfall gains at the expense of US taxpayers is so politically unpalatable that it is hard to imagine the CBA proposal ever getting adopted. So the question

[86] Dynamic Spectrum Alliance Comments at 18 (10/31/18).

for the FCC is, do they really want to bring such a deal to Congress when it is so likely to get shot down?

On the other hand, if the FCC avoids going to Congress for approval, this not only raises the litigation risk, it creates huge new political risks. Given that major US companies like Google, Comcast, and T-Mobile, as well as consumer interest watchdogs like the Public Interest Spectrum Coalition have all been commenting extensively about the politically distasteful aspects of the deal, the cat is already out of the bag. If well connected companies and organizations like these are unhappy about the process you can be sure that both the administration and Congress are already aware of these issues.

Thus, even if Congress is avoided and the CBA proposal fully approved, there still remains considerable risk that Congress could step in at any time, possibly even one or two years into the process and block the deal. Or they could tax away all the windfall gains leaving the CBA unfunded and unwilling to complete the job. This would mean that not only have several years been lost, but we are stuck in a half completed spectrum clearing process. Who is going to pay to finish the job or unwind it? There is no doubt a wave of litigation would soon ensue. Therefore it is best that the FCC make sure we never have to deal with such a situation.

D. Race to 5G

Next, I would like to call into question the whole idea that we are in a "Race to 5G", and in particular, a race against China. First, if anyone hasn't figured this out already, just read a few of the following articles[87] and you will realize that China is not even in the race. Western governments feel that China has broken the rules and thus dealt themselves out of

[87] https://www.bloomberg.com/news/articles/2018-08-23/australia-toughens-stance-on-5g-phones-citing-foreign-influence
https://www.bloomberg.com/news/articles/2018-11-23/u-s-urges-key-allies-to-avoid-using-huawei-equipment-wsj-says?srnd=premium-asia
https://www.bloomberg.com/opinion/articles/2018-12-06/huawei-cfo-arrested-over-sanctions-not-spying?srnd=opinion

the competition. So, there is no reason the US needs to hurry to beat China to 5G. China could be 10 years ahead in 5G and have products ready to sell that the US hasn't even dreamed of, but there will be no US domestic buyers for those products. No US company is going to risk putting Chinese products in their critical infrastructure for at least a generation.

Second, consider the notion of a race to 5G. If there is a race to 5G then it would seem like spectrum is the track on which that race will be run. Therefor it seems unjustified to claim that these spectrum clearing proceedings are the "Race to 5G". More accurately they could be called the race to build a 5G track. But why is this so important? Is it really that critical to have the first 5G track? Why can't you win the race on someone else's track? Given that China is not in the race any more, and the remaining competitors are all open, free market economies in which foreign firms can fairly compete, why is it so important to have the first track?

And if the home field advantage is so important that American companies would not be able to win the race on a foreign track, then why is there even a worry about a race? When the American track finally opens up, foreign companies will not be able to compete here either. In my opinion, this whole logic about the Race to 5G seem spurious at best. Granted, we don't want to miss the race to build a good track. But if we come in 2nd or 3rd, but have the biggest and best track around, it is difficult to imagine how much harm could be done. So the most important factor is not speed, but spectrum.

This point appears to have been missed by the CBA who speak of speed nine different times in their proposal, but don't once mention additional spectrum.[88] They seem to have forgotten that to win a race you need a good track to train on. Yet, their proposal cripples America's chances of winning, by confining our world class competitors to the equivalent of a one lane horse track.

[88] CBA Comments (10/30/18).

IV. COST TO REPURPOSE SPECTRUM

The value of the 5G to the US economy is widely cited to be $500 billion dollars.[89] Given the value of the C-band spectrum, necessary to realize these economic gains, was estimated above to be $66 billion dollars, as much of this band as possible should be repurposed, no matter what the cost. However, some methods of repurposing cost much more than other methods and good fiscal management would dictate that the FCC try to repurpose the spectrum as cheaply as possible while still meeting its other goals.

There are two types of costs that need to be considered here. Direct costs, being the loss of revenue to the US Treasury, and indirect costs, being costs to society of various methods of repurposing the spectrum. I will consider each in detail.

A. Cost to the US Treasury

There is no doubt the CBA proposal is the most costly to the US Treasury because it allocates none of the spectrum proceeds to the government. The T-Mobile proposal isn't much better in this regard, directing 80% of the proceeds away from the Treasury, if large amounts of spectrum are repurposed.[90] In contrast, a regulatory directive by the FCC to repurpose the spectrum would direct all of the proceeds to the US Treasury. However, given that the FCC, as a matter of policy, would compensate all incumbents for any losses incurred, some of these funds would be redirected towards that purpose. But the amounts involved here are not likely to be large in comparison to the value of the spectrum.

[89] CTIA, The Global Race to 5G, at 4 (Apr. 2018) ("Global Race Report"), https://api.ctia.org/wp-content/uploads/2018/04/Race-to-5G-Report.pdf.
[90] T-Mobile Comments at 14 (10/31/18).

In the case of a 200MHz repurposing as proposed by the CBA the costs are well known as they have been reported by Intelsat to be less than $4 billion.[91] Thus acceptance of the CBA proposal would have a direct cost to the US Treasury of $62 billion.[92] If the full 500MHz was repurposed the cost was calculated above at $4.55 billion dollars, which means the CBA proposal would have a direct cost to the US Treasury of $61.4 billion.

Incidentally, if you are wondering how Intelsat came up with that $4 billion dollar cost number, so am I. The $4.55 billion number to clear all 500MHz of spectrum, worked out above using the Brattle Report methodology, was very comprehensive and detailed, making it difficult to argue with. So, one wonders why it should cost $4 billion to clear only 200MHz of spectrum when under this scenario all users continue to use C-band, meaning no lost profits to satellites companies are incurred, no earth stations need to be decommissioned, and no fiber needs to be installed. Most Wall Street analysts that I have seen have estimated this number at conservatively less than $1 billion. The $4 billion quoted would represent roughly half of the market value of the North American operations of all the consortium members.[93]

Despite these huge sums being lost to the US Treasury under the CBA proposal, Eisenach claims that "it is factually inaccurate to argue that the Market-Based Approach harms taxpayers. To the contrary, taxpayers will benefit in multiple ways, including from the availability of new high value services, enhanced economic performance, and higher tax revenues generated from the rapid reallocation of C-band spectrum to 5G mobile broadband."[94] But what Eisenach seems to forget is that all of these benefits will be achieved by the other proposals to clear spectrum as well. Everyone agrees that clearing spectrum will produce

[91] CEO Stephen Spengler in the Q3 earnings conference call said Intelsat's costs would be "between $1 - $2 billion", but "probably towards the higher end of that range". This equates to less than $4 billion for the entire consortium. https://seekingalpha.com/article/4215885-intelsat-sa-q3-2018-results-earnings-call-transcript?part=single

[92] $66 billion proceeds - $4 billion costs = $62 billion.

[93] I'm assuming North American operations account for half of the total company values here.

[94] Eisenach Reply Comments at 4 (12/7/18).

economic benefits, some of which will flow through to the US Treasury. The more appropriate question is, will the CBA proposal produce more benefits to taxpayers than any other approach? Below I show that the answer to this question is an emphatic no.

B. Cost to society

The second cost is the cost to society in repurposing spectrum. Since all proposals will repurpose spectrum, this cost is usually discussed in terms of lost benefits in delaying the reallocation of spectrum. It is generally assumed that the CBA proposal will be faster than other proposals. I have questioned this assumption above and don't believe it to be correct. However it is instructive to analyse the CBA's claims in this area, just in case their proposal turns out to be faster.

The Brattle report states that one year of delay would reduce the value to society of the spectrum by 7-11%[95] and notes that these figures are arrived at by using 8-12% discount rates. However the report gives no indication of where these 8-12% discount rates come from. Examining the model closely, we can see that these are incorrect rates to use. The report models two cash flows which are exactly the same, except that one is shifted back in time. Basically society gets the same 5G benefits in both cases, just in a delayed manner in the latter case. Since the cash flows are the same under his model, the delayed cash flow has no additional risk to it, and thus should be discounted at the risk free rate. Current risk free rates for medium terms (3-5 years) are in the 2.7% range, nowhere near the 10% median discount rate quoted above. Applying a proper discount rate to the $500 billion dollars of societal value gives us an annual cost of $12.5 billion.[96] Comparing this number to the $62 billion loss to the US Treasury, by using the CBA proposal, implies that the CBA proposal needs to be 5 years faster than any

[95] Intelsat/SES/Intel Comments at 48 (page 27 of the Brattle Report) (10/30/18).
[96] Since the report's 10% median discount rate generated a 9% median cost to society, I have assumed a 2.7% discount rate would generate a 2.5% cost to society.

FCC run proposal just to break even. Given the relative experience between the two parties and historical outcomes using transition facilitators, it would seem to be a rather risky bet to conclude the CBA will be more than 5 years faster than the FCC.

If that isn't bad enough, all these cost models neglect the greatest cost of all to society. That is the cost of getting less spectrum. This cost to society is much greater than any cost of delaying. So, for example, even if there was a 10% cost per year of delaying, if delaying could reap society an additional 100-150% more spectrum then society would be much better off even with very long delays. Depending on the marginal value of additional spectrum, society could be something in the order of 100% better off by waiting for more spectrum.

Various other commenters attempt to make non-quantitative arguments for why it should be acceptable to permit windfall profits in the tens of billions of dollars to be had. One such attempt focuses on the liberalization of spectrum policy. The ITIF comments, "this increasing reliance on market forces and property-style rights driving discovery of and investment in more valuable uses of spectrum. The market-based approach utilizing secondary market transactions would be a bold, commendable step forward by the Commission."[97] This idea of relying on the market place to determine optimal prices and quantities is a good one, which few would disagree with. However this idea incorporates various economic assumptions which do not hold in this situation.

First, secondary market agreements are not free open markets. They are vastly inferior to a true marketplace where all eligible parties can participate in price discovery in an open transparent environment. Secondary market agreements are more akin to private placements in the investment world, where an investment banker will have a price in mind and then show the deal to a few favored clients and then finally award the deal on a set of non-public factors, many having nothing to do with the optimum price. Such processes have the potential to

[97] ITIF Comments at 2 (10/30/18)

degenerate into shady back room deals concluded for inappropriate reasons such as future business promises, other side deals or joint agreements, offers of future employment, political lobbying support, and so on, none of which have anything to do with fair, open, efficient markets.

Second, using markets to determine optimal prices and quantities assumes the product being supplied is not bogged down in contractual constraints, maximum supplies, litigation risks and concerns about optimizing windfall profits. Efficient prices and quantities can never be achieved under such impediments.

Third, the application of market approaches assumes that the seller has the requisite property rights to be able to engage in the selling transaction. In this case, the CBA most certainly does not.

1. Spectrum property rights

First, there are major questions about the applicability of spectrum property rights attaching to bandwidths that the incumbent never paid for. Certainly if the CBA had obtained their rights by a competitive auction, paying large amounts of money to acquire these rights, then the situation would be different and they should be able to freely sell those rights to other parties, for similar use, at whatever price the market dictates. However, they did not. They received these spectrum licenses for free.

Eisenach, in his report, claims, "Nor is it relevant that the C-band licensees did not directly pay for their licenses at the time of issuance."[98] His reason is that, "the C-Band licensees have invested billions of dollars in launching and maintaining their satellite fleets, fulfilling the regulatory bargain inherent in the issuance of their licenses."[99] My reply is, how

[98] Eisenach Reply Comments at 18 (12/7/18).
[99] Id.

is this relevant? Every licensee has to comply with the terms of the license. If you don't like the terms, then don't apply for the license. How does meeting the terms of your license ever justify being awarded tens of billions of dollars in windfall gains?

As far as the billions of dollars invested, once again, how is that relevant? No one in any of the comments has ever suggested that incumbents wouldn't receive fair compensation for any lost investments and even the future value of returns on those investments.

Eisenach continues with another reason stating, "as an economic matter, past payments for spectrum rights are sunk costs, which do not affect licensees' incentives to participate in secondary markets."[100] One more time, how is this relevant in justifying tens of billions of dollars in windfall gains? Are you implying that such extraordinary gains are necessary to entice satellite companies to the table to relinquish spectrum? I would strongly suggest otherwise, being willing to bet that if the FCC took the whole idea of windfall gains off the table, satellite companies would be able to think straight and would be willing to consider proposals that reward them with slightly more than the market value of the assets they will be losing, as any economically rational participant should do.

In one final attempted justification of windfall gains Eisenach states, "the FCC traditionally has not conditioned spectrum rights on whether licensees originally paid for their license rights."[101] To support this claim Eisenach cites the examples of the original CMRS licenses and DBS licenses.[102] These are particularly bad examples because both of them date back to 1982-83.[103] I submit that FCC policy has greatly changed since this time. What Eisenach should have cited was much more recent 2016 Broadcast Incentive Auctions. Here the FCC could have simply allowed the incumbent broadcast license holders to enter into

[100] Id.
[101] Id.
[102] Id.
[103] Jeffrey A. Eisenach, The Equities and Economics of Property Interests in TV Spectrum Licenses, Navigant Economics (2014) at 3-7

SMAs and sell the spectrum themselves. But it didn't. Instead the FCC chose to hold incentive auctions to clear the spectrum, eliminating the possibility of extraordinary windfalls going to the existing license holders who paid nothing for their spectrum. Furthermore, the situation with broadcaster licenses is much more similar to the current situation because there is a change of use occurring with the spectrum in question, whereas in the examples cited by Eisenach there was no change of use.

Another aspect of spectrum property rights is concerning the matter of whether the incumbent actually owns the licenses required for the repurposing. In this case the satellite companies do not. They own FSS licenses, whereas the wireless companies desiring the spectrum will require terrestrial 5G licenses. The CBA so much as admits that they have nothing worth selling in their proposal by actually asking the FCC to give them the terrestrial rights. Here is the request:

> 1. Adding a co-primary mobile allocation to the Table of Frequency Allocations for terrestrial mobile service in the C-band Downlink and a new U.S. footnote stating that terrestrial mobile use may be authorized provided it has been coordinated by a secondary market agreement with the consortium of fixed-satellite service operators;[104]

So, the CBA is effectively asking the FCC to just hand them rights which are estimated to be worth $66 billion. They even have the audacity to term this transaction a "modest rule change".[105]

The best analogy of this situation is, imagine that a state is putting in a big new highway on land they own. There are some homeowners that live nearby, but not on any of the land where the highway is being laid. The homeowners then say to the state, that highway you are building will make a lot of noise which will ruin our livelihood, so we want compensation.

[104] CBA Comments at 4 (10/30/18).
[105] Id.

Now clearly the homeowners should receive some compensation, and perhaps the highway operators should even pay for the homeowners to move. But in this situation the homeowners are saying, because all that noise is so terrible, we shouldn't receive just compensation. The state should give us the rights to all the land the highway will be laid on. And then we'll auction that land to the highway operators ourselves![106] Clearly such a request is outrageous.

But Eisenach disagrees, arguing that it is consistent with FCC policy to grant additional use licenses to incumbents even in the face of potential windfalls. He cites the upper microwave flexible use licenses as an example, quoting the FCC, "awarding mobile rights to incumbent licensees could be viewed as a windfall to those licensees . . . [but] the benefits of expediting service and facilitating the coordination of fixed and mobile service outweigh any potential disadvantages of granting mobile rights to incumbents."[107] However, upon closer examination is it clear that Eisenach had to torture this quote to get it to say what he desired. Have a look at the full quote.

> We recognize that awarding mobile rights to incumbent licensees could be viewed as a windfall to those licensees, *although the Commission contemplated granting mobile rights when it first created LMDS.* ***Here***, the benefits of expediting service and facilitating the coordination of fixed and mobile service outweigh any potential disadvantages of granting mobile rights to incumbents.[108]

Notice the part of the quotation that I have emphasized. In a highly questionable action Eisenach replaces the word 'Here' which implies that this action relates to a specific unusual case, with the word 'but' which implies an all-encompassing justification for such an action. Next, look at the part of the quote I have italicized which was completely left out of Eisenach's

[106] To make this analogy precisely the same as the current situation I should add that the homeowners have been given, by the state, the right to live without noise. Nevertheless, the state also gave the homeowners the land upon which they live for free. In addition, the contract that the homeowners accepted also included a clause acknowledging that the state is free at any time to revoke the contract at any time and reacquire the land.
[107] Eisenach Reply Comments at 12-13 (12/7/18).
[108] Federal Communications Commission, In the Matter of Use of Spectrum Bands Above 24 GHz For Mobile Radio Services et al, Report and Order and Further Notice of Proposed Rulemaking, GN Docket No. 14-177 et al (July 14, 2016) at ¶87. Italics and bold emphasis added.

quote. This is critically important in that the FCC contemplated in the many discussions leading up to awarding of these licenses that it would be a band used for mobile. Thus all parties using this band were aware of this potential and likely future use. The FCC spells this out even more clearly in the same document, noting,

> When the Commission established rules for the 39 GHz band, it contemplated that 39 GHz licensees would have the opportunity to engage in mobile operations if the associated technical issues could be resolved. Accordingly, in the NPRM, we proposed to permit existing 39 GHz licensees to exercise the full extent of these rights – including mobile rights – for geographic areas and bands in which they currently hold licenses.[109]

The FCC even adds a second reason for their decision to grant mobile rights, stating,

> the differences between fixed and mobile operation are increasingly blurred. We therefore suggested that attempting to define separate bundles of "fixed" and "mobile" rights might create unnecessary complexity and be inconsistent with the underlying technologies, in which case it would be more efficient to have both the fixed and mobile usage rights contained within the same license.[110]

But Eisenach gives us none of this addition information. Once this is done, all can see that this case involved a highly unusual situation that offers no parallels whatsoever with the current licenses the satellite companies own. If one doubts this conclusion, I once again point you to the 2016 broadcast incentive auctions, where the FCC easily could have granted the broadcasters mobile wireless licenses to sell themselves. But it chose not to, instead deciding to use incentive auctions to clear the desired spectrum.

Eisenach produces many more reasons why the CBA approach, with its accompanying windfall profits, is still the most desirable option. He claims that "To prohibit or proscribe their

[109] Id at ¶83.
[110] Id.

ability to benefit economically from relinquishing their spectrum rights would . . . create a precedent that would weaken incentives for market-based spectrum reallocation for the foreseeable future."[111] I can't see why this should be the case. Any rational economic player should have enough incentive to clear spectrum if their realised proceeds are greater than the market value of what they are losing. Of course everyone would like to receive tens of billions of dollars of windfall profits to clear spectrum. But if the FCC takes this possibility off the table, now and for the future, then prospective spectrum clearers will not even consider it. On the contrary, adopting the CBA proposal is likely set a horrible precedent which the FCC will be regretting for years to come. As PISC as so well describes, "a private sale would set a dangerous precedent, suggesting that incumbent licensees should always wage maximum resistance against giving up or sharing unused spectrum unless the Commission agrees to give them all the public revenue".[112]

Another aspect of social costs is the above market prices that wireless carriers will have to pay to the CBA because of their monopoly status.[113] Numerous commenters point this out with T-Mobile probably stating it best, saying, ""satellite licensees together would have a monopoly and would be negotiating as a single entity, they would likely demand higher prices than a truly competitive market would support"[114] The CBA tries to alleviate these concerns by noting the potential availability of other areas of mid band spectrum.[115] However these other bands are just that, potential. Nothing definitive has been decided and there are no immediately available large swaths of spectrum that could act as substitutes for carriers not wishing to pay monopoly prices. Once the repurposing of this C-Band spectrum begins carriers will be under competitive pressure to have 5G service offerings. They won't be able to wait around for some

[111] Eisenach Reply Comments at 4 (12/7/18).
[112] PISC Comments at 4 (10/31/18).
[113] The CBA has already constrained the quantity of spectrum offered to an economically sub-optimal amount, so their monopoly power will be felt in terms of higher prices paid by wireless carriers and ultimately by consumers.
[114] T-Mobile Comments at 17 (10/31/18)
[115] CBA Comments at 35 (10/30/18).

potential spectrum to come onto the market. They will be forced to bid for this C-Band spectrum or risk losing tens of thousands of valuable customers to a competitor. So the charge of the CBA being a monopoly supplier stands.

Finally, the CBA has come up with a brand new reason to justify their proposal's windfall profits, in their latest reply comments filing. They state, "Any returns realized by members of the C-Band Alliance will represent a return on the entrepreneurship of the FSS operators in coming forward with and implementing a value-creating secondary market transaction".[116] Let's be serious here people. This is not Stephen Jobs creating a new computer company. This is more akin to some investment banker working on a tax arbitrage deal to shift lawfully owed tax debts out of the hands of the US Treasury. It is most definitely not the type of entrepreneurship that anyone should be condoning, let alone granting $66 billion worth of unearned property rights to.

V. PROTECTION OF CURRENT USERS

Protecting the current C-Band users is a theme that is apparent in virtually every comment submitted. However, as I noted above, the CBA makes the erroneous assumption that to protect a user means to keep them in their current C-band environment. They would have you believe that there are no possible substitutes for C-Band. The CBA states, fiber is "not available everywhere and often cost prohibitive".[117] Fiber could not be put in place within the time frame required.[118] Ku-band is "notorious for being subject to severe rain fade conditions".[119] And no other technology offers the reliability of C-band.[120] The CBA even has us worry that we might miss the Super Bowl if C-band is not utilised[121], completely ignoring the fact

[116] CBA Reply Comments at 4 (12/7/18).
[117] CBA Reply Comments at 11 (12/7/18).
[118] CBA Comments at 7 (10/30/18).
[119] CBA Reply Comments at 11 (12/7/18).
[120] CBA Comments at 15 (10/30/18).
[121] Id.

that this spectrum repurpose does not affect the uplink portion of the spectrum. So any potential outages due to ill-timed fiber breaks or rain fade would be local events only.

A. Multiple Alternatives Available

But, it is simply false that no good substitutes to C-band exist and to protect these users they must remain there. To protect means to keep safe from harm. When applied to a business this means economic harm. Thus, any method of clearing spectrum which will provide users with something close to their original functionality and compensate them for any economic harm incurred is an appropriate form of protection. Whilst no substitute is a perfect substitute, when the problem is considered in this manner, it is obvious that there are many available alternatives to trying to keep all the satellite company customers in the C-band.

Verizon perfectly spells out this broader understanding of the word 'protect', remarking, "'Protected' status could mean that the traffic is moved to a different transponder on the same satellite or on a different satellite, is moved from the C-band to different frequencies such as the Ku-Band, is moved to fiber and delivered to the same destination of the earth station, or any number of other options including use of updated compression technology."[122] They note that C-Band traffic could be delivered on different frequencies such as the Ku-band, and that technology exists to mitigate the effects of rain fade.[123] In fact, the CEO of VSAT Plus International actually calls the idea that Ku-band cannot be deployed due to rain fade a myth, and notes that his firm offers "uptime guarantees ranging from 99.70% - 99.95% using Ku-band frequencies. The same that we guarantee for C-Band frequencies."[124] And they offer these guarantees in Africa, which gets a heck of a lot more rain than the US.

[122] Verizon Comments at 12-13 (10/31/18).
[123] Id at 13-14.
[124] Ali Entesharіun, "C-Band vs Ku-Band", Linkedin.com, accessed December 2, 2018. https://www.linkedin.com/pulse/c-band-vs-ku-band-ali-enteshari

Verizon further adds that, "Much C-band traffic can be transitioned to fiber where fiber is readily available, particularly in urban or suburban areas. Fiber offers lower latency than C-band connectivity, greater capacity, and greater security from radio frequency (RF) interference. And fiber is increasingly available."[125] Verizon even points out that they currently use the fiber delivery approach to ship out video content to each of their sub-tending markets.[126] T-Mobile's study by Roberson and Associates estimates that all of the C-band users in Cook County, Illinois, representing 1.6% of the US population, could be converted to fiber for just $8 million.[127] The top 30 metropolitan areas in the US which have at least 2 million population account for 45.7% of the US population.[128] Applying the same cost per population estimates generates a total cost of only $228 million to move nearly 50% of the US population off C-band. This is a staggeringly low cost which neither CBA nor the Intelsat/SES/Intel filings ever even attempt to refute. Their only comment is "it would not work for large swaths of suburban and rural America".[129] Well even if that is correct it still means that for a comparatively trivial sum of money half the US population can be moved off of C-Band. To the extent that C-band usage is correlated with population it means that we should be able to begin with a 250MHz clearing target before the CBA even starts their repacking efforts. If their consolidation efforts are able to clear 200MHz then there should be no problem with 400MHz as a cleared spectrum goal.

The NCTA does have a few issues with these cost estimates,[130] but even if they were off by a factor of 10, that still only gets us into the vicinity of what Intelsat says it will cost the CBA to clear just 200MHz of spectrum.

[125] Verizon Comments at 14 (10/31/18).
[126] Id at 15.
[127] T-Mobile Comments at 75 (10/31/18).
[128] Id at 65.
[129] CBA Comments at 7 (10/30/18).
[130] NCTA Comments at 13 (10/31/18).

Another mode of content delivery that could be used as a substitute for C-band is the very technology that is replacing them, 5G. Such applications are already being tested overseas[131] and are being planned here as well, with Verizon preparing to offer free Apple 4K TV to early adopters of 5G.[132] In fact, 5G is so powerful that it should be able to deliver a C-band satellite's entire throughput and still only represent a maximum of 5% of the terrestrial sites capacity.[133] Furthermore, since most broadcasting is not live, much of the delivery could be done at off peak hours when the network is not heavily utilized. But even during the busiest network periods, earth stations would always be prioritized to receive their crucial data first. This is a perfect example of why the FCC got rid of net neutrality. Major businesses with the need for higher reliability for their mission critical applications are willing to pay more to ensure these reliability needs are met. It is easy to envision earth stations working with individual carriers to put in place redundant broadcast equipment, electrical generators, and additional fiber lines to the broadcast station to increase reliability. They may even agree to contracts that have a performance component to incentivise wireless carriers to increase their service reliabilities.

Additionally, earth stations would be able to utilize combinations of 5G and fiber, or 5G from several different carriers to create very high levels of reliability likely surpassing 99.9%. Now granted, terrestrial options can never have the reliability of satellite based signals. Because of the flexibility that full-band full-arc reception provides, an earth station can receive its transmission from any of the multiple transponders that each satellite carries, as well as from

[131] Jorn Krieger, "Rhode & Schwarz sets up TV broadcasting over 5G trial". Broadbandtvnews.com accessed December 4, 2018. https://www.broadbandtvnews.com/2018/09/13/rohde-schwarz-sets-up-tv-broadcasting-over-5g-trial/

[132] "Five Ways 5G Will Rock Our World" Forbes.com. accessed Dec 4,2018. https://www.forbes.com/sites/insights-intelai/2018/09/21/five-ways-5g-will-rock-our-world/

[133] This is calculated by noting that C-band satellites are capable of delivering roughly 450Mbps/100MHz of bandwidth. https://www.reddit.com/r/askscience/comments/rdak1/how_much_bandwidth_do_satellites_have Using Qualcomm's real world simulations of 5G they realised network capacity of 9Gbps using the same amount of bandwidth. https://www.qualcomm.com/news/onq/2018/03/07/predicting-real-world-5g-performance So if a satellite transmitted at full capacity all the time it would represent only 5% of 5G network capacity.

multiple satellites. This means there are dozens, if not hundreds, of redundancies built into the system and this is the reason FSS can provide 99.999% reliability, commonly known as “five nines” reliability.

The difference between having ‘three nines’ and ‘five nines’ reliability would be a quantifiable probabilistic event. Therefore, this is a risk which is readily capable of being insured away. In the very rare 0.09% of times where a negative event occurs which results in an economic loss, the former C-band user can be protected from this loss by insurance. C-band users who are truly unable to tolerate any down time could move to Ku-band which, as noted above, already has reliability approaching that of C-band. Also, Ku-band combined with any other terrestrial delivery option would surely provide reliability matching C-band.

B. The Costs of Change

Now C-band users reading this will be saying, wait a minute. All this fiber, 5G use and possibly even insurance on top of that will likely be much more expensive than satellite based delivery. And if we all try to crowd into Ku band that may be even more expensive. My response to this is, it should be! 99.999% reliability isn’t something that should come cheap. We want prices to go up so that the sparse spectrum resource is optimally allocated. Right now C-Band users get no price signal to show them they are using a valuable resource. The main problem that we are facing here is that C-Band users have been spoiled with artificially cheap levels of high reliability because the spectrum they use has been given away for free rather than being sold for its most optimal use. If C-band users had to pay rates that reflected the fair market price for the spectrum they use, it is doubtful many of them would really “need” 99.999% reliability.

Now, of course, C-band users are never going to want to move. They are receiving an extremely under-priced product, a free lunch so to speak. Nobody would want to move when

they are getting such a great deal. This fact explains the so called "strong cross-industry support"[134] cited by the satellite consortium. They are all C-band users and the CBA is telling them they offer the only proposal that won't affect users in a big way. Of course they are going to support the CBA proposal.

What is actually shocking is low little real support for the CBA proposal there is. I conducted an analysis of all 62 final comments filed with the FCC. Excluding satellite companies and C-band users, there were only 5 filings that supported their proposal. What was even more amazing is that 2 C-band users were against the CBA proposal and fully 60% of the C-band users offered no support for their proposal whatsoever.

But this state of affairs is history and now is the time to correct these failures and put the spectrum to its most economically optimal use, once and for all ending the free lunch to C-band users. The market needs to be deregulated so that they are effectively charged market prices for the spectrum they use. Historical regulatory actions have caused this situation and a regulatory response is required to fix it.

Whilst it is true that the prices for content delivery may rise for C-band users, this is through no fault of their own and they should be compensated for any increase in prices, at least up to the duration of their contracts, and possibly as long as the duration of the FSS license. This should make C-band users economically indifferent to moving. In the long run they will all benefit from the change. Eventually nearly all video content delivery will move to fiber. Even 5G delivery will likely prove to be just a short term remedy before 8K and even 16K[135] TV becomes ubiquitous.[136]

[134] Intelsat/SES/Intel Reply Comments at 2 (12/7/18).
[135] Even 16K is being tested now overseas. Matthew Allard Acs, "8K is now being broadcast in Japan", Newsshooter.com accessed December 5, 2018. https://www.newsshooter.com/2018/12/01/8k-is-now-being-broadcast-in-japan/
[136] But perhaps 6G or even 7G might be able to handle these data volumes.

For those rare companies that truly require “five nines” reliability, it will still be available, for a price. The Ku-band will become a highly demanded bandwidth. Also, in reading the many comments from the aviation industry on the needs for a guard band to prevent airline equipment malfunctions, I am convinced there will need to be a small slice of C-band at the top end of the spectrum that will remain only for FSS use. Something on the order of 50MHz will provide room for a few “must have” C-band users. They will pay a very high price. But it will be available. And finally, if the demand for such reliability was strong enough, the satellite companies could always bid for some of the terrestrial spectrum themselves.

I would like to end this section by acknowledging the many C-band user comments lamenting how the loss of C-band spectrum will greatly affect, and some even claim, end their businesses. Reading such stories is gut wrenching. Given compensation schemes that will be put in place and the wide variety of alternative methods to transmit content, I have great doubts about the extent of suffering being anywhere near what is claimed. But, even if it is half what is stated, this is still a sorrowful state of affairs.

However, this is how capitalism works. Old models using outdated and inefficient technologies need to be swept aside to make room for the new. Yes, some jobs will be lost and some businesses will be closed, but if we allow new industries to grow and prosper, many more businesses will be conceived, many more investment opportunities generated, and many more jobs will be created. We should never let regulatory inaction entrench incumbents at the cost of growth and prosperity to the rest of society. Such actions stifle innovation, crush productivity, and leave all of us worse off. So everyone should hope this never happens.

VI. PROPOSALS FOR SPECTRUM REPURPOSING

A. The CBA Proposal

The FCC must choose between 3 competing proposals. First, is the CBA proposal that has been covered in great detail throughout this paper. This proposal is highly specified in the documents filed to the FCC, giving it much greater clarity than any other proposal on offer. However, one would be surprised if such "entrepreneurial" activity didn't occur, given the potential payoff of a $62 billion dollar windfall. In contrast, the other commenters suggesting proposals have no massive windfall to realize. So the FCC shouldn't use the corresponding lack of detail in their proposals against them, when conducting its evaluation.

The main purported advantage of the CBA proposal is a faster time to repurpose spectrum. However, I have argued that, if there is any speed advantage, it is likely occurring at the cost of cutting corners. Furthermore, the uncertainty surrounding the speed of repurposing is immense, with such a proposal facing massive litigation and political risks. Finally, I have argued that speed isn't actually as important as everyone thinks, especially on an economic basis. The social cost of delay, when calculated correctly, is hardly relevant compared to the cost to the taxpayers.

On the amount of spectrum repurposed, the CBA proposal clears an extremely suboptimal quantity, as well as locks the 5G industry into this internationally uncompetitive amount for years to come. And most importantly of all, by freeing so little spectrum, the CBA proposal produces a massive social cost which dwarfs all other costs discussed in the comments.

Regarding the cost of the spectrum repurpose, the CBA proposal represents a tremendous cost to the US Treasury. But, even worse, it creates huge incentives for spectrum speculation in the future, which will dog the FCC for years to come.

Finally, what the CBA regards as one of its greatest attributes, fully protecting C-band users, is actually a negative. Their plan to keep all their customers in the C-band runs in the opposite direction of deregulation and locks in highly inefficient use of the spectrum for a decade or more, and effectively continues the government subsidization of C-band users.

B. The T-Mobile Proposal

The T-Mobile proposal has grown in detail and workability during the course of the comments. It is basically a combination of a standard regulatory clear and auction, and the CBA proposal, with the CBA having complete freedom to decide which form the process will ultimately most look like. The plan has the admirable property of eliminating the low hanging fruit that the CBA desires to pluck, forcing them to do the hard work of clearing large amounts of spectrum if they want their windfall. But, the plan suffers from several legal constraints, most notably the FCC's lack of authority to share auction proceeds.[137] However, this authority should not be difficult to obtain if Congress felt this was the best plan. The worst part of the T-Mobile plan is that it includes the CBA plan, and thus also suffers from nearly every one of the problems that have been discussed so far.

Given that the CBA has already indicated they will not participate in such a plan,[138] it will end up being just a mandatory clear and auction of 300MHz. So the FCC should simply skip the unnecessary auction formalities of the T-Mobile proposal and just get straight to clearing the 300MHz. Also, given that this is just a normal clear and auction approach, there is no reason to be locked into only 300MHz. The FCC can clear additional amounts of spectrum, if desired.

[137] CBA Comments at 59-60 (10/31/18).
[138] CBA Reply Comments at 2 (12/7/18).

C. FCC Clear and Auction

This leads us into the third proposal for the FCC to consider, the traditional clear and auction mechanism that we have just been discussing. There were several commenters who stated this was their preferred method, including Google, Competitive Carriers Association, and US Cellular. Given that the CBA refuses to participate in a T-Mobile type incentive auction process I'm sure T-Mobile and American Cable Association, who both advocated an incentive auction, would also join this list.

There is not a whole lot to say about this process as it is well known and been carried out many times in the past. I think the main point of discussion is the fact that it differs from the FCC's preferred method of using a reverse auction. It is completely understandable that the FCC would be somewhat reluctant to use regulatory powers to clear spectrum, given their inclination towards reverse auction type methods which create incentives for incumbents to voluntarily vacate. It is always better if an incumbent should volunteer to move rather than be forced, and reverse auctions are the perfect method to do this. But, sometimes it simply must be recognized that reverse actions are impossible. For example, if the FCC desires to clear an entire band, a reverse auction process can't be used because all incumbents need to be bought out and this fact effectively grants each one of them monopoly powers. Thus, if you want to clear the whole band the only way is regulation, because market processes can't be made to work in such a situation.

The current situation in the C-Band with each incumbent having non-exclusive spectrum rights is a similar situation. It is simply impossible to get market processes to work in such a situation. To accept the CBA process you do gain the attribute of the process being voluntary, but you also have to grant them monopoly status over the sale of the spectrum being sold, as well throw away the reverse auction process and instead grant them the auction powers of the FCC and the ownership rights of the US Treasury.

Processes to induce voluntary action are a commendable idea, but you can't give away the keys, and, in fact, the whole farm just to keep the process voluntary. It is just far, far too costly. The benefits of maintaining a voluntary process don't even approach the costs of doing so in these cases.

The benefits lost by the process not being voluntary are minimal. As long as holders of spectrum licenses know that they will always be fully compensated for any unexpected changes made, their incentive to invest will not be significantly reduced. Said another way, knowing that I will only ever have to voluntarily move will not produce significantly more investment than knowing that if I have to move I will be fully compensated. These two outcomes should be nearly the same to the economically rational participant. Therefore, sometimes, as in this case, you just need to admit that the clearing process can't be done in the manner you would prefer, and just get on with the regulatory process to do the job.

D. Google's Combination Process

Finally, I would like to highlight a fourth possible approach which Google suggests but does not really elaborate on. In Google's comments they spoke very favorably about both conventional FCC auctions[139] and overlay licenses.[140] This raises the obvious idea of combining these two approaches. You would begin by granting every registered earth station an overlay license. The satellite companies maintain all their FSS rights across the entire 500MHz of spectrum, and continue to broadcast their signals just as they are currently doing. Since satellite downlinks are way too weak to ever bother a mobile network, nothing needs to be done by the satellite companies and the FCC can immediately begin the auction process.

[139] Google Comments at 10 (10/31/18).
[140] Id at 14.

Now here is the twist. The buyers of spectrum can, but are not required to, negotiate with the earth stations. This eliminates the hold out problem. Instead they are simply required to provide them with a viable alternative to C-band, and pay for their insurance to economically cover any reliability differences. Many earth stations will already have access to fiber. Some can be paid to move, others can have fiber installed. Yet others can have their additional cost of moving to Ku band paid. If nothing else is viable, they can have their content delivered by the very 5G that is displacing them from C-band.

When 5G arrives into their area, if some other option hasn't already been implemented, the earth station simply switches to receiving their content from the 5G carrier instead of from a satellite. Some locations will take years before 5G arrives. Some areas will never receive 5G and so the satellite companies can keep transmitting indefinitely for such customers. But, whenever 5G is delivered to an area, the spectrum owner has the responsibility to pay for and implement an alternative content delivery solution for the earth station, before the overlay is lifted. Once that happens the overlay is lifted for good.

Nothing could be simpler. The satellite companies don't need to change a thing. If other options don't present themselves as better solutions, the earth stations only need to install wireless receivers, and be ready to flip a switch changing their receiving method when 5G arrives. The moment that earth station flips the switch and ceases to be a satellite company customer, the satellite company will receive compensation for the present value (PV) of all future revenue from that customer. So everyone is made whole. No one is harmed. The spectrum bidders will assess the cost of implementing alternative delivery mechanisms for the earth stations in each geographic area they bid for, and incorporate this cost into their bids.

This method is incredibly fast, much faster than anything else proposed. The FCC auction process can begin immediately. The 5G rollout process can begin as soon as the FCC auctions determine the new spectrum owners. In some urban areas, where fiber is readily

available, the rollout could occur virtually immediately. In most areas, where 5G is used as the delivery mechanism, the rollout should be extremely quick. There is no waiting for three years to move satellites around involved here. And there is no administrative burdens on the FCC to develop and implement compensation procedures.[141] Instead the new spectrum license owners have the incentive of their entire investment pressing them to quickly get alternative content delivery methods in place for the earth stations and get the overlays lifted.

In this method the FCC would not be required to repurpose any of the band for wireless use. The satellite companies could keep all the licenses they currently possess. The only regulatory change required would be for the FCC to rescind the FSS protection clause which is no longer needed because it has been replaced by the overlay licenses. The CBA has already asked the FCC to do this in their own proposal.[142]

One additional advantage of rolling out 5G in this manner is that it would provide the wireless carriers a large new source of revenues from customers transitioning from C-band. The new 5G networks would have large sources of demand from day one. This will make the spectrum much more valuable for the US government to sell, as well as promote more competition, and faster rollout times. In rural areas, where satellite use predominates, carriers would have major incentives to bring 5G into these areas to capture these large new corporate customers, which should incentivize greater access to 5G in rural areas.

Implementing a process such as is imagined here would have many other positive benefits. Satellite companies would have huge incentives to become incredibly efficient in their use of C-Band, as well as work on new technologies to make Ku band as reliable as C-Band. This would have far reaching consequences for future satellite technology as well as signal compression technology.

[141] The FCC still would have to develop a formula for fairly compensating the satellite companies for their lost customers.
[142] CBA Comments at 4 (10/31/18).

Earth stations would huge incentives to adopt new filtering technologies. Since satellite companies didn't lose any of their FSS licenses, if technologies could be developed which would allow earth stations to filter 5G signals out and allow satellite signals to be operable, this would present a boon for satellite companies as then, both them and the wireless industries could co-exist in the same spectrum. If such technologies were developed they could be applied to other spectrum regions and the benefits to society would be enormous. In short, this method will be a win-win situation for everyone.

VII. CONCLUSION

In summary, the CBA proposal carries much more political risk, litigation risk, and implementation risk than any other proposal. It locks the 5G industry into the least optimal amount of spectrum cleared for potentially a decade or more, and is orders of magnitude more costly than any other proposal. It's only possible redeeming feature is that it may clear spectrum slightly faster, but even this is a highly doubtful claim.

The T-Mobile integrates too much of the CBA proposal, with all its inherent flaws, to be looked at favourably in its own right. Additionally, since participation in such a proposal has already been rejected by the CBA, the T-Mobile proposal ends up being just an overly complex and time consuming clear and auction process.

The only option left on the table for the FCC is a traditional clear and auction process and so this is the proposal that the FCC should accept. There is the additional possibility of incorporating some aspects of Google's overlay proposal which would greatly accelerate the clearing side of the traditional FCC run process.

Respectfully submitted,

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